## DETAILED ACTION

### *Response to Arguments*

1. Applicant's arguments with respect to claims 1-11 have been considered but are moot in view of the new ground(s) of rejection.

### *Drawings*

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the thermoelectric cooler on which the at least one of the first converter, the second converter and the optical WDM converter are mounted on must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New

Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 3-5 and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Muraguchi (US 5,432,874) in view of Nakanishi et al (US 6,374,021) and Verdiell (US 6,252,726).

1). With regard to claim 1, Muraguchi disclose a system (Figure 2) for converting first and second signals representative of payload (High Speed Electrical Signal in Figure 2, the video, audio, data signals etc. column 4 line 39-40) and supervisory (Low Speed Electrical Signal in Figure 2, control signal, etc., column 4, line 40-41) information, respectively, between an electrical format and a WDM aggregated optical format, the system including:

at least one first converter (the Electro-Optic Converter 8 in Figure 2) for converting said first signal between said electrical format and a first, disaggregated optical format (column 4, line 56-68),

at least one second converter (the Electro-Optic Converter 9 in Figure 2) for converting said second signal between said electrical format and a second, disaggregated optical format (column 4, line 56-68), and

at least one optical WDM converter (the Multiplexer 10 in Figure 2) for converting said first and second signals between said first and second disaggregated optical formats and said WDM aggregated optical format (column 3 line 62-65),

wherein at least one of said at least one first converter, said at least one second converter and said at least one optical WDM converter are integrated to a single self-contained module (transmitting apparatus, Figure 2) by means of signal propagation paths that exempt from slices (Figure 2, no splices are used in the system; column 1 line 64 to column 2 line 9; and in column 3 line 48 to column 5 line 44, Muraguchi describe his invention "in detail with reference to Fig. 2". In Figure 2 and the detailed description, Muraguchi teaches an integrated transceiver; there is no discrete components having pigtails and needed to be spliced together. Therefore, in Muraguchi's system, splices as defined by the applicant are not needed).

Muraguchi teaches that all components of the transceiver are within the transceiver apparatus (1 or 2 in Figure 2). But, Muraguchi does not expressly state (A) wherein at least one of said at least one first converter, said at least one second converter and said at least one optical WDM converter are in a hermetic enclosure, and (B) wherein at least one of the first converter, the second converter and the optical WDM converter are mounted on a thermoelectric cooler.

With regard to item (A), however, to put the components of a transceiver in a hermetic enclosure or a sealed module is well known and a widely practice in the art. Nakanishi et al teaches that the first converter (e.g., LD 169 in Figures 21 and 22), the second converter (e.g., PD 168 in Figures 21 and 22) and the optical WDM converter (the WDM filter 171 in Figures 21 and 22) are sealed in a package (Figures 23-25).

Nakanishi et al provides a transceiver module that has a simple structure, and is easily manufacturable, and high reliability, and low cost; and the transceiver sealed in a package can be easily shielded from the harmful effects of a hazardous environment. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply a hermetic enclosure that encloses the laser diode and photodiode and the WDM as taught by Nakanishi et al to the system of Muraguchi so that a compact, high reliable and low cost transceiver module can be obtained and the harmful effects of a hazardous environment can also be shield.

With regard to item (B), Verdiell, in the same field of endeavor, teaches an optoelectronic package (e.g., Figures 2 and 3) for housing optoelectronic and/or optical components (e.g., laser diode etc.) using hermetic enclosure; and the optoelectronic component (e.g., 255 in Figure 2) is mounted on a thermoelectric cooler (Figure 2, the Peltier cooller 225 and plates 240 and 250, column 5, line 12-56).

As disclosed by Verdiell, the heat generated in the package will interfere with the electrical path, and most WDM optoelectronics require temperature control (e.g., wavelength control of transmitting lasers, heat dissipation of pumps). Without the necessary temperature control, difficulties may arise in controlling the wavelength of

transmitting lasers. Similarly, without temperature control, the proper dissipation of heat from, for example, pump lasers, could cause problems. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply a thermoelectric cooler as taught by Verdiell to the system of Muraguchi and Nakanishi et al so that the heat generated from the optoelectronic components can be dissipated and the system become more reliable, and the wavelength of the laser diode can be more accurately controlled.

2). With regard to claim 3, Muraguchi and Nakanishi et al and Verdiell disclose all of the subject matter as applied in claim 1 above. But, Muraguchi does not expressly disclose wherein the optical WDM converter is a beam splitter.

However, the beam splitter or combiner used as the demuxer/Muxer is well known and widely in the art. Nakanishi et al discloses such a beam splitter (Figure 3 and 61 in Figure 7).

Because of the simple structure and small size of the beam splitter, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the beam splitter to the system of Muraguchi so that a low cost and simpler structure transmitter can be obtained.

3) With regard to claim 4, Muraguchi and Nakanishi et al and Verdiell disclose all of the subject matter as applied in claims 1 and 3 above. And Muraguchi and Nakanishi et al further disclose wherein said beam splitter is arranged to transfer optical radiation (Laser Light Signal in Figure 2) between said first converter (8 in Figure 2) and optical fiber (3 in Figure 2).

But Muraguchi does not expressly disclose that said beam splitter has associated an optical connector.

However, Nakanishi, discloses an optical connector (152 in Figure 19, column 15 line 29) to get a better alignment between the lens and the fiber so to reduce the light loss (column 8, line 13-22).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the optical connector taught by Nakanishi to the system of Muraguchi so that a receptacle type of connector can be obtained, and the maintenance and replacement of fiber is made easier, and the WDM aggregated optical format can be easily inputted into the fiber and loss due to the alignment is reduced.

4) With regard to claim 5, Muraguchi and Nakanishi et al and Verdiell disclose all of the subject matter as applied in claims 1 and 3 above. And Muraguchi and Nakanishi et al further disclose that said beam splitter is arranged to transfer optical radiation (Light Signal in Figure 2) between said second converter (9 in Figure 2) and optical fiber (23 in Figure 1).

But Muraguchi does not expressly disclose wherein said beam splitter has associated an optical connector, and the beam splitter defines an optical signal reflection path between the second converter and the optical connector.

However, Nakanishi, discloses a beam splitter arranged to define an optical signal (Figure 3 and 61 IN Figure 7), and Nakanishi also teaches an optical connector (152 in Figure 19, column 15 line 29) to get a better alignment between the lens and the fiber so to reduce the light loss (column 8, line 13-22).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the splitter and optical connector taught by Nakanishi to the system of Muraguchi so that a receptacle type of connector can be obtained, and the maintenance and replacement of fiber is made easier, and the WDM aggregated optical format can be easily inputted into the fiber and loss due to the alignment is reduced.

5). With regard to claim 9, Muraguchi and Nakanishi et al and Verdiell disclose all of the subject matter as applied to claim 1 above. And Muraguchi further disclose wherein said first converter and said second converter include sources (laser light and LED, column 3, line 58-62) driven with said first and said second signals in said electrical format (High Speed or Low Speed Electrical Signals), respectively, and wherein said optical WDM converter includes a WDM combiner (Multiplexer 10 in Figure 1) to combine said first and said second signals in said first disaggregated optical format and said second disaggregated optical format (Figure 2) to produce said WDM aggregated optical format (multiplexed signals to fiber 3, Figure 2), the system thus comprising a transmitter module (Transmitter Apparatus 1, Figure 2, column 1 line 65 or column 3 line 38-40).

But, Muraguchi discloses that one light source is laser source and another is a LED; Muraguchi does not disclose that the two light sources are lasers. However, since the laser source has a narrow band width and is widely used in the art, it would have been obvious to one of ordinary skill in the art at the time the invention was made to

replace LED with the the laser diode so to increase the signal capacity and transmission rate.

6). With regard to claim 10, Muraguchi and Nakanishi et al and Verdiell disclose all of the subject matter as applied to claim 1 above. And Muraguchi further disclose wherein the optical WDM converter includes a WDM splitter (Demultiplexer 11 in Figure 2) for de-multiplexing the WDM aggregated optical format (inputted from fiber 6 in Figure 2) into a first disaggregated optical format (the Laser Light Signal to O/E Converter 12 in Figure 2) and said second disaggregated optical format (the Light Signal to O/E Converter 13 in Figure 2), and wherein said first converter and said second converter include photoelectric converters (Opto-Electro Converter in Figure 2) for converting said first disaggregated optical format and said second disaggregated optical format into said first and second signals in said electrical format (output High Speed Electrical Signal and Low Speed Electrical Signal, respectively, column 3 line 65 to column 4 line 3), the system thus comprising a receiver module (Figure 2, column 1 line 65 to column 2 line 2).

7). With regard to claim 11, Muraguchi and Nakanishi et al and Verdiell disclose all of the subject matter as applied in claim 1. And Muraguchi further disclose the system includes:

a pair of said first converters (8 and 12 in Figure 2) in the form of a first laser source (8 in Figure 2) and a first photoelectric converter (12 in Figure 2), respectively;

a pair of said second converters (9 and 13 in Figure 2) in the form of a second light source (9 in Figure 2) and a second photoelectric converter (13 in Figure 2), respectively; and

a pair of said optical WDM converters (10 and 11 in Figure 2), in the form of a WDM combiner (10 in Figure 4) and a WDM splitter (11 in Figure 4), respectively;

such that said first laser source and said second light source are arranged for converting a first pair of first and second signals representative of payload (High Speed Electrical Signal in Figure 2, the video, audio, data signals etc. column 4 line 39-40) and supervisory information signal (Low Speed Electrical Signal in Figure 2, control signal, etc., column 4, line 40-41), respectively, from said electrical format into a first pair of first disaggregated optical format (Laser Light Signal in Figure 2) and second disaggregated optical format signals (Light Signal in Figure 2) and said WDM combiner (10 in Figure 2) is adapted to convert said first pair of first and second disaggregated optical format signals into a first WDM aggregated optical format signal (the multiplexed signal to fiber 3 in Figure 2), and

wherein said WDM splitter (11 in Figure 2) is adapted to convert a second WDM aggregated optical format signal (Signals from fiber 6) into a second pair of first (the Laser Light Signal to O/E 12) and second (the Light Signal to O/E 13) disaggregated optical format signals, and said first photoelectric converter (12 in Figure 2) and said second photoelectric converter (13 in Figure 2) are adapted to convert said second pair of first and second disaggregated optical format signals into a second pair of first and second signals representative of payload (High Speed Electrical Signal in Figure 2, the

video, audio, data signals etc.) and supervisory (Low Speed Electrical Signal in Figure 2, control signal, etc., column 4, line 40-41) information in said electrical format, the system thus comprising a transceiver module (Transmitting apparatus, Figure 2).

But, Muraguchi discloses that the second light source is a LED; not the laser light. However, since the laser source has a narrow band width and is widely used in the art, it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace LED with the laser diode so to increase the signal capacity and transmission rate.

5. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Muraguchi and Nakanishi et al and Verdiell as applied to claim 1 above, and in further view of Bloom et al (US 5,710,652).

Muraguchi and Nakanishi et al and Verdiell disclose all of the subject matter as applied in claim 1 above. Muraguchi further discloses wherein said first converter and said second converter have associated signal processing electronics to generate said first and said second signals representative of said payload and said supervisory information, in said electrical format (Figure 2, the High Speed Electrical Signal and Low Speed Electrical Signal are applied to the E/O Converters 8 and 9 in Figure 2, it is obvious these signals are generated by a signal processing electronics).

But, Muraguchi does not expressly disclose that said signal processing electronics being integrated to said single self-contained module.

However, Bloom et al, in the same field of endeavor, discloses a processing electronics being integrated to said single self-contained module (Figure 3 and Figure 4,

the laser drive electronics or power supply PS is within the single self-contained module Figure 3, column 2 line 22-25 and column 3 line 25-26).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to put the signal processing electronics within the transceiver module as taught by Bloom et al to so that a compact transceiver can be obtained.

6. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Muraguchi and Nakanishi et al and Verdiell as applied to claims 1, 3 and 4 above, and in further view of Ventrudo et al (US 5,589,684).

1). With regard to claim 6, Muraguchi and Nakanishi et al and Verdiell disclose all of the subject matter as applied to claims 1 and 3 above. But, Muraguchi and Nakanishi et al do not expressly disclose radiation focusing elements.

However, Ventrudo et al, in the same field of endeavor, disclose that a beam splitter has associated radiation focusing elements (lens 15 and 16 in Figure 1) interposed between said beam splitter and said first and said second converter.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use focus elements as taught by Ventrudo et al to the system of Muraguchi and Nakanishi et al and Verdiell so that light beam can be easily projected to the beam splitter and the signal loss can be reduced.

2). With regard to claim 7, Muraguchi and Nakanishi and Verdiell disclose all of the subject matter as applied in claims 1, 3 and 4 above. But, Muraguchi and Nakanishi

et al do not expressly disclose a focusing element interposed between the beam splitter and the optical connector.

However, Ventrudo et al disclose a further focusing element (21 in Figure 1) interposed between said beam splitter and said optical connector for focusing onto said optical connector optical radiation propagating from said beam splitter.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use focus elements as taught by Ventrudo et al to the system of Muraguchi and Nakanishi et al and Verdiell so that light beam can be easily focused to the fiber and the signal loss can be reduced.

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Muraguchi and Nakanishi et al and Verdiell and Ventrudo et al as applied to claims 1, 3, 4 and 7 above, and in further view of Calvani et al (US 5,329,394) and Laznicka (US 5,686,990).

Muraguchi and Nakanishi et al and Verdiell and Ventrudo et al disclose all of the subject matter as applied in claims 1, 3, 4 and 7 above. But Muraguchi and Nakanishi et al and Verdiell and Ventrudo et al do not expressly disclose that the system further includes an optical isolator interposed between said beam splitter and said further focusing element.

However, Calvani et al, in the same field of endeavor, teach an optical isolator (9, 209 and 210 in Figure 2) prevent the rays reflected by the mirror or the plate et al from re-entering lasers (column 4 line 33-34). Another prior art, Laznicka, also teaches an

optical isolator (e.g., 39 in Figure 3) interposed between said beam splitter (37 in Figure 3) and said further focusing element (41 in Figure 3).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the optical isolator as taught by Calvani et al and Laznicka to the system of Muraguchi and Nakanishi et al and Verdiell and Ventrudo et al so that the rays reflected by the lens or fiber end can be isolated, the interference to the diode lasers can be avoided, and then the signal quality can be improved.

## ***Conclusion***

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LI LIU whose telephone number is (571)270-1084. The examiner can normally be reached on Mon-Fri, 8:00 am - 5:30 pm, alternating Fri off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Vanderpuye can be reached on (571)272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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/Kenneth N Vanderpuye/
Supervisory Patent
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